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LARVAL MORTALITY OF INDIAN TASAR SILKWORM (*ANTHERAEA MYLITTA*) (SATURNIIDAE) DUE TO PÉBRINE INFECTION

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ABSTRACT. Large scale mortality of tasar silkworm, *Antheraea mylitta*, occurs during commercial rearing seasons because of pébrine caused by *Nosema* sp., a microsporidian pathogen. This paper reports comparative mortality by instar in pébrine free and pébrine infected larvae during three rearing seasons—rain, autumn, and winter.

Additional key words: seasonal variation, *Nosema*, pathogen, *Bombyx mori*.

Pébrine is a common disease of the tasar silkworm caused by a pathogen *Nosema* sp., which results in heavy mortality to the tasar silkworm, *Antheraea mylitta* (Drury). Little literature is available on tasar mortality due to pébrine (Jolly 1968). Most studies on pébrine have focused on *Bombyx mori* L., examining effects of temperature and humidity on pébrine occurence (Dasgupta 1950), seasonal incidence of pébrine (Deviah & Krishnaswami 1975), and seasonal variation on larval mortality caused by pébrine (Noamani et al. 1971). Studies on drug effect and susceptibility of *Malacosoma disstria* Hübner to *Nosema distriae* have been reported by Wilson (1984) and Chandra and Sahakundu (1983). However, there is no published information on the rate of mortality of the tasar silkworm due to pébrine. Hence, this investigation was conducted during 1988 to determine the susceptibility of tasar silkworm to pébrine disease in different larval stages and different seasons.

MATERIALS AND METHODS

Mated females of *A. mylitta* were segregated into pébrine free (PF) and pébrine infected (PI) groups after microscopic examination of the moths in the grainage at the State Tasar Research Farm, Durgapur, Mayurbhanj District of Orissa, India. The grainage is a specially designed house for preservation of tasar seed cocoons and production of

healthy tasar eggs at a commercial scale. Pébrine free and pébrine infected eggs were collected after oviposition. The eggs were allowed to hatch, and twenty replications of 500 hatchlings of both pébrine free and pébrine infected *A. mylitta* were reared on *Termilalia tomentosa* Wt. & Arn. (Combretaceae) in isolated rearing fields at the State Tasar Research Farm. The mortality of pébrine free and pébrine infected larvae at each instar was tabulated. The experiment was repeated during three commercial rearing seasons, i.e., July–August (Rain), September–October (Autumn), and November–December (Winter) of 1988. The data were analyzed statistically using Student's *t*-test (Snedecor & Cochran 1967). Climatological parameters, such as maximum and minimum temperature, relative humidity, and rainfall during experimental periods were recorded.

RESULTS

Mortality of tasar silkworm is common in cultures due to outdoor rearing methods which subject them to adverse climatic conditions, predators, parasites, and diseases. Observations indicated that percentage mortality of pébrine infected larvae was greater than that of pébrine free larvae in all instars except the 5th and in all seasons. The probability values ($P < 0.001$) of the *t*-tests demonstrate a statistically significant difference in percentage mortality of pébrine free and pébrine infected larvae, except for 1st instars in the winter sample (Table 1). Mortality was consistently higher in pébrine infected larvae in instars 1–4 and in pébrine free larvae in instar 5. Within the pébrine free samples, percentage mortality was higher in the 1st and 5th instar than in the 2nd, 3rd, and 4th instar. Within the pébrine infected samples, percentage mortality was higher in the 3rd and 4th instar than in the 1st, 2nd and 5th instar.

DISCUSSION

Sen et al. (1969) reported that mortality of *A. mylitta* larvae was accelerated from the 3rd instar onwards, with increasing intensity of disease symptoms. However, the present investigation indicated that the pathogen was most active and virulent during the 3rd and 4th instars inducing maximum mortality. This is similar to earlier observations by Wilson (1984) in *M. distriae* in which he concluded that 3rd instar larvae are more susceptible than 5th instar larvae.

Comparatively lower percentage mortality in pébrine infected larvae in the 5th instar may be due to elimination of larvae susceptible to the pathogen in the 3rd and 4th instars, a possible inactive phase of the pathogen in the 5th instar, or the development of immunity in the surviving larvae.

TABLE 1. Percentage mortality ± standard deviation of pébrine free (PF) and pébrine infected (PI) larvae of *A. mylitta* at different instars and during different seasons of 1988.

Season	Larval condition	1st instar	2nd instar	3rd instar	4th instar	5th instar
Rain	PF	18.11 ± 1.23	12.94 ± 1.38	11.84 ± 1.20	10.90 ± 1.21	15.50 ± 1.29
	PI	19.13 ± 1.57	13.55 ± 1.60	22.90 ± 1.68	28.54 ± 1.35	8.27 ± 1.55
	t =	P < 0.001	P < 0.001	P < 0.001	P < 0.001	P < 0.001
Autumn	PF	20.17 ± 1.24	13.25 ± 1.28	12.11 ± 1.18	11.80 ± 1.57	16.53 ± 1.18
	PI	21.40 ± 1.31	14.43 ± 1.57	24.06 ± 1.23	30.34 ± 1.56	9.15 ± 1.55
	t =	P < 0.001	P < 0.001	P < 0.001	P < 0.001	P < 0.001
Winter	PF	15.96 ± 1.91	10.48 ± 1.20	8.19 ± 1.36	8.59 ± 1.18	13.22 ± 1.26
	PI	16.04 ± 1.96	11.41 ± 1.57	19.54 ± 1.19	25.09 ± 1.31	6.45 ± 1.38
	t =	NS*	P < 0.001	P < 0.001	P < 0.001	P < 0.001

* NS = Not significant.

TABLE 2. Mean values ± standard deviation of some environmental parameters during different rearing seasons of *A. mylitta* during 1988.

Parameters	Rain	Autumn	Winter
Daily maximum temperature (°C)	35.17 ± 1.68	34.40 ± 1.39	29.70 ± 1.28
Daily minimum temperature (°C)	22.78 ± 1.23	20.33 ± 1.18	16.27 ± 1.14
Daily relative humidity (%)	91.40 ± 1.78	90.00 ± 1.89	81.67 ± 1.58
Total rainfall (mm)	312.50	142.83	20.83

The average temperature, relative humidity, and rainfall were all least during winter, coinciding with the lowest larval mortality. These climatic features were highest during 'rain' and medium during 'autumn' (Table 2). The medium temperature and relative humidity regimes coincide with highest larval mortality, which is similar to observations by Dasgupta (1950) in *B. mori*. Medium temperature and relative humidity apparently stimulate the pathogen. However, Deviah and Krishnaswami (1975) found minimum incidence of pébrine in *B. mori* at higher temperature and relative humidity, and maximum incidence at low temperature and relative humidity. In contrast, Noamani et al. (1971) reported that temperature and relative humidity have no relation to incidence of pébrine. Although our data and results are consistent with the findings of some previous studies regarding the role of climatic factors on the mortality of pébrine infected *A. mylitta*, they are contrary to those reported in other studies. Hence, it is clear that this topic requires further investigation.

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